

May 5, 2001

## **Assessment of Alternative Fuels Transportation in New Delhi, India**

### **Background:**

During former President Clinton's historic visit to India, former U.S. Secretary of State Madeleine Albright and India's Minister of External Affairs Jaswant Singh issued a joint statement on energy and the environment on March 22, 2000. The agreement focuses on the development of cooperative programs to foster clean energy and environmental protection. In addition, in October of 1999, former Energy Secretary Richardson and Singh signed an agreement to increase cooperation in energy and the environment. As a result of these two agreements, the U.S. and India have created a Joint Consultative Group of Clean Energy and Environment to foster bilateral cooperation, government-to-government dialogue and encourage public and private sector cooperation. In July, 2000, a delegation of seven representatives from the U.S. Department of Energy, including Ms. Marcy Rood, Office of Transportation Technologies' National Clean Cities Program, conducted a "scoping mission" with Indian government and industry officials.

In April of 2001, Ms. Rood and Mr. Ted MacDonald, U.S. Environmental Protection Agency, Office of International Affairs, led a delegation to New Delhi, India to participate in a conference on alternative fuel vehicles, entitled "International Conference and Exposition on Sustainable Development of Alternate Energy Driven Vehicles Programme," sponsored by the Society of Indian Automobile Manufacturers (SIAM) and the Central Pollution Control Board.

Participants included: Richard Bechtold, Senior Project Manager, QSS Group, Inc. (a consultant to DOE's Office of Transportation Technologies); Al Ebron, Executive Director, National Alternative Fuels Training Consortium, West Virginia University; Hank Frisz, Professor, City University of New York; Joby Jallevana, Product/Market Manager for Marine and Natural Gas, Deere Power Systems; and Susan Sullivan, California Air Resources Board.

### **Market Situation:**

On March 31, 2001, an India Supreme Court ruling went into effect in New Delhi mandating the conversion of the entire bus fleet to compressed natural gas (CNG). In addition, taxis and auto rickshaws must be replaced with engines running on clean fuels. The Supreme Court has issued a six month extension until September 20, 2001, for getting diesel vehicles retrofitted to CNG, but operators had to get permits stating that they had kits or new engines on order. Vehicles that had not been converted or did not have permits were taken off the road at the end of March.

In essence, 12,000 transit buses must be converted to natural gas; including 200 to 2000 school buses (received conflicting information—some transit buses operate as school buses) must be converted to natural gas; and taxis must be converted to natural gas or use new engines meeting Euro II standards. Three wheelers must also be converted to CNG or be a new vehicle meeting Euro II. The Federal fleet of cars must meet Euro standards or convert to CNG. Delhi has a very large population of old vehicles, 93-92%, and has now banned taxis, buses and auto rickshaws older than 15 years. A natural gas pipeline is operating from Mumbai and supplies natural gas in sufficient quantities to the New Delhi market. However, many gas lines have not been completed from the main pipeline. This has caused havoc in Delhi because natural gas is often delivered in cascades on government trucks and not in a timely manner. In some cases, operators must wait hours to get sufficient supplies.

Transit buses: Only two Indian chassis manufacturers exist--TATA and Ashok Leyland. The 42 buses currently operating on natural gas are using stoichiometric Cummins engines. Delhi Transport Corporation (DTC) currently operates 2000 buses and private franchises operate 10,000 buses. Indian buses generally use 140-160 horsepower engines. Most have no hydraulic system for suspension, no air conditioning/heating and have high floors. Delhi Transport is proposing a 1 rupee fare increase to 3 rupees to help pay for the new repowered

engines. However, the private operators are installing conversion kits. Nugas is the only certified company for CNG bus conversions. The company has orders for 4,200 conversions and it is unlikely to meet the order by the end of September. In all cases, tanks are placed below the floor. A new CNG bus costs around 16 lakhs. DTC has placed orders for 1,880 CNG buses. Ashok Leyland is very supportive of CNG due to favorable results. Training programs have not been established for mechanics nor drivers of the buses.

Refueling: Three bus depots offer CNG. The Delhi Principal Secretary of Transportation would like all 33 depots to operate CNG refueling. The Gas Authority of India Ltd. (GAIL) currently has plans to install 90-120 public CNG refueling stations for light-duty vehicles across the city. About one-half of these publicly accessible stations are already in place, using Tulsa Gas Technologies equipment. The India Supreme Court has mandated that at least 90 refueling stations be made available. Taxi cab drivers and rickshaw drivers fill at 68 "daughter stations." Natural gas buses are filled at 3 "mother stations." The methane content for compressed natural gas is 88 percent. Natural gas is about 33% cheaper than diesel. Subsidies for natural gas will be dropped in April 2002.

Light-duty: As of April 1, 2000, non-commercial 4-wheelers must meet Euro II emission standards in order to be registered in the Capital Region of New Delhi. Commercial vehicles, such as taxis, must be also meet Euro II emission standards or use CNG in order to be registered in the Capital Region of New Delhi. There are about 6,850 light-duty vehicles (1,500 taxis, 650 auto rickshaws and 4,700 privately owned cars) already converted to CNG. CNG tanks are regulated to be steel and no composite material is allowed. A brand new, good quality CNG kit with cylinder costs around 32,000 rupees or \$6,400, while a substandard locally-made welded version is half the amount. Cylinder safety is a major concern. It is crucial to create awareness among taxi drivers about purchasing cylinders that meet standards from certified installers and maintaining them properly.

Incentives available include an exemption in the 12% state sales tax and a 3% low-cost loan option. Delhi government is currently asking for an excise tax waiver for new CNG vehicles and a waiver on the customs duty of imported CNG kits from the Finance Department.

Future Plans: GAIL is also proposing that commuter buses and trucks drop off passengers and goods at certain points outside the perimeter of the city and then transport passengers and goods on CNG vehicles to the Center City.

The Delhi Principal Secretary of Transportation expressed an interest in working with the U.S. Clean Cities program to assist with the implementation of the Supreme Court ruling and thought the Clean Cities model would be a good approach to adopt. He is also interested in deploying U.S. natural gas vehicle technologies and working to establish adequate training programs.

A successful program in New Delhi is extremely important because other cities may be asked to follow the same rule, and other cities also look to New Delhi as a model and will want to emulate the program. Good training programs for mechanics and drivers are critical for success.

Other fuels being considered include propane and electricity. There are demonstration programs in place for converting three wheelers to electric power; buses and vehicles operate at the Taj Mahal using electric batteries. Although the Indian government has cleared the use of LPG, laws and regulations governing its use in vehicles have not been established. There are concerns over the safety of LPG conversions because of lack of oversight of the installment of kits. An Indian company has designed an LPG conversion kit for scooters, the most numerous vehicle in Dehli. GAIL is currently building the largest LPG pipeline in the world. Clean Diesel is also gaining appeal, with a goal of 500 ppm sulfur content (the current average sulfur content of diesel fuel is much higher).

### **In addition to attending the Conference, specific meetings were held on alternative fuels:**

U.S. Asian Environmental Project, Country Director, Von Millard and Northern Regional Technical Rep. Balakrishnan

U.S. AID, Office of Energy, Environment and Enterprise, Mr. Seshadri and Mr. Ashok Sarkar

Society of Indian Automobile Manufacturers (SIAM),  
Pamela Tikku, Executive Officer, or K.K. Gandhi, Senior Advisor

Principal Secretary of Transportation, Government of Delhi,  
Ashok Pradhan

Bharat Petroleum, S. Mohan, General Manager LPG

Petroleum Conservation Research Association, Mr. K.K. Dhingra, Executive Director

Ministry of Environment and Forests, Mr. Rajiv Kher, Joint Secretary

Center for Science and Environment, Mr. Anil Agarwal, Director, and Ms. Anumita Roychowdhury

The World Bank, Mr. Sameer Akbar, Environmental Specialist

### **Areas of Cooperation Identified:**

Coordinate a technology tour in the U.S. for Indian Federal and local government and private sector officials.

Establish a training program in the following areas:

Overview of CNG for government and DTC bureaucrats

Train the trainer on CNG technology in the areas of: 1) conversions; 2) cylinder inspection; 3) emission/diagnostics

Establish the Apex body or Clean Cities-like model in Delhi to help develop collaboration on CNG and other alternative fuels.

Provide general outreach materials on CNG to the Petroleum Conservation Research Association, which works with drivers on efficiency issues and provides outreach materials to the general public.

Collaborate with U.S. EPA on the Green Fleets Program for attracting multinationals to use natural gas delivery vehicles.